

THE SUBSPECIES OF *ANOPHELES AMICTUS* EDWARDS
(DIPTERA, CULICIDAE).

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(Eight Text-figures.)

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Introduction.

Edwards (1921) described the new species *Anopheles amictus* Edw. from Townsville, Queensland, and in the same paper recorded a similar specimen which varied from the type female in the banding of the hind tarsi ("female from Townsville, 2 :ii :1903, F. P. Dodd"). Later, Hill (1925), having examined considerable material from both Townsville and the Northern Territory, recorded both the type form of *A. amictus* and the variant mentioned above, which he queried as *A. amictus* and designated as "C". Since that time Hill's "type C" or "Hill's variety" have been names commonly used by Australian entomologists to differentiate this form from *A. amictus* Edw. (*sens. str.*) and, despite the very close relation between the two, the ease with which they may be separated and the complete absence of indeterminate specimens have given rise to a distinct and general impression that the two forms are both biologically and morphologically distinct.

One of us (A.R.W.) has had the opportunity of studying these forms in the Northern Territory, and, by a process of breeding series from individual females, has obtained convincing evidence that the two forms enjoy a constant distinction in morphology and a considerable measure of ecological separation. Further, the two forms, although having a wide distribution together, do appear to attain geographical separation in certain areas. For these reasons we have decided that the unnamed form is fully deserving of a subspecific* name, and hence record herein the two subspecies *A. amictus amictus* Edw. and *A. amictus hilli*, n. subsp.

ANOPHELES AMICTUS AMICTUS Edwards, new status.

Edwards, F. W., 1921. *Bull. ent. Res.*, xii, 71 (*Anopheles amictus*).

Type locality: Townsville, Queensland.

Types: Type female and male in British Museum. It is not clear whether or not the male has been designated as an allotype.

It is unfortunate that we have had to rely on specimens of Edwards' species, determined by himself, rather than on the holotype, for our more detailed knowledge of this form, particularly in respect of the major diagnostic character which was not mentioned in the original or subsequent descriptions. On the other hand we have had before us the material used by Mackerras (1927) for his description of the larva of *A. amictus*, and hence the additional characters of importance detailed by us have been found in the actual specimens used in the preparation of the original larval description.

* Recent authors (Huxley, 1942, p. 151 et seq.; Mayr, 1942, p. 33 et seq.) have indicated that a considerable body of evidence has accumulated substantiating the hypothesis that subspecies are developed by geographical separation. In the present case the origin of one or other subspecies by original geographical isolation is feasible, since it will be shown that only one has been found in New Guinea. Despite this, however, a further hypothesis, that the separation has been an ecological one, is not disproven, and as there is obviously much in common between geographical and ecological isolation of populations, it is considered that the use of the subspecific category is amply justified, even though any evidence of hybrid zones is lacking. Further, the practical value of such a nomenclature is considerable.

Adult.

In addition to the characters recorded by Edwards (1921, 1924) the most outstanding feature is the propleuron, which carries an elongate boss running transversely across the middle, from which arise from 10–14 strong bristles. The character which serves best to distinguish this subspecies from the following is the banding of the tarsi which is adequately described by Edwards.

Larva.

No mention of the thoracic chaetotaxy was made by Mackerras (1927) in his larval description. Here, however, we have found a most important character in the pleural hair-tufts. The pro-pleural, meso-pleural and meta-pleural groups have one of the long hairs (the outer one) plumose, in each group. Also the inner shoulder hair has no basal tubercle and possesses about eight branches (range 8–10). No constant differences have been discovered between the larva of this subspecies and *A. amictus hilli*, n. subsp., but the difference in the average number of branches of the inner shoulder hair is useful.

Distribution.—This subspecies has a wide distribution from the northern part of Western Australia across northern Australia and on the eastern part of Queensland to the New South Wales border. Specimens have been seen from the following localities: Northern Territory: Adelaide R.; Larrimah; Roper River Mission; Roper Bar; Delamere; Victoria River Downs. Queensland: Cairns; Mareeba; Townsville; Eidsvold; Augustus Downs; Chinchilla. New South Wales: Detman. Western Australia: Argyle Downs; Wyndham; Noonkambah.

ANOPHELES AMICTUS HILLI, n. subsp.*

Type locality: Adelaide River, Northern Territory of Australia.

Types: Holotype female, allotype male, 32 paratypes, 22 larval morphotypes and a series of eggs are lodged in the Museum of the Council for Scientific and Industrial Research, Canberra, A.C.T.

We have chosen for the type series of this subspecies an unusually wide range of material which has the distinction of being entirely the progeny of a single female. The eggs, larvae and adults were all produced from the one wild-caught female and so there can be no question of the discreteness of the series. The parent female is also included in the series of paratypes, the specimen, as one would expect, being somewhat too worn to be satisfactory for the holotype.

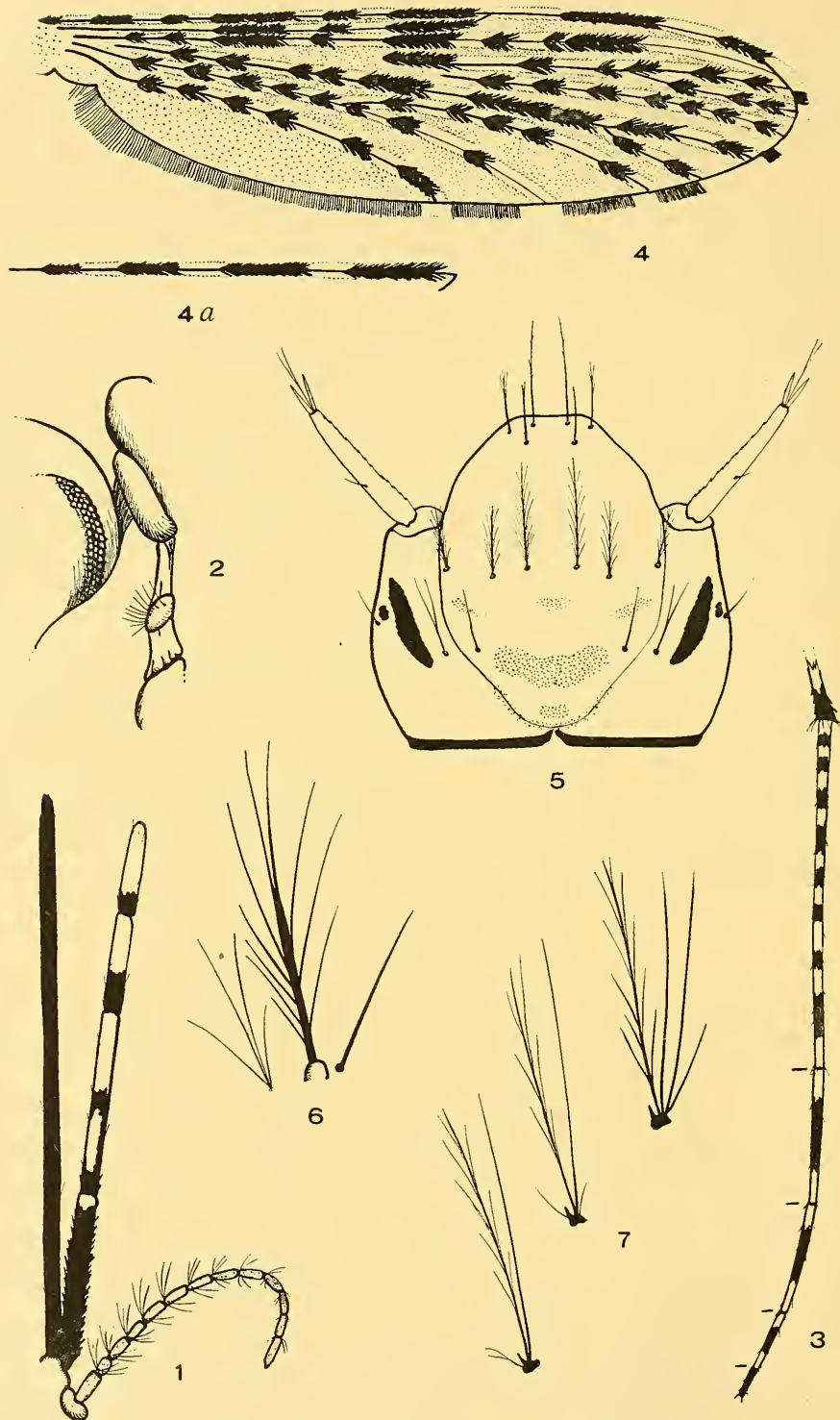
DESCRIPTION.

Female.

Head. (Fig. 1.) Dorsally the head is clothed with upright-forked scales which are dark posteriorly and laterally, and white anteriorly. A frontal tuft of long white hairs projects forward between the bases of the antennae. The antennae are rather shorter than in other Australasian Myzomyias, except *A. amictus amictus*, being only about 0.6 the length of the proboscis, while the pedicel and flagellar segments I–VIII carry flat white scales. The palpi have segments III–V black basally with broad white apical bands, segment III has a dorsal patch of white scales on the black basal portion and segment II is black with a narrow white apical ring and some indistinct pale scales dorsally on the basal half. The proboscis is entirely dark scaled with dark brown labella.

Thorax. The scutum and scutellum carry broad white scales and dark hairs, while the pleurae are bare except for some scattered white scales on the sternopleuron and distinct upper mesepimeral and pre-alar bristles. The propleuron (Fig. 2) carries an elongate transverse boss which bears ten strong bristles and a few white scales. In

* This new subspecies exhibits undoubted similarity to *A. incognitus* Brug 1931, *Geneesk. Tijdschr. Ned.-Ind.*, lxxi, 136, a species described from a unique larva only found at Merauke. However, the extremely well-developed seven-branched posterior clypeal hairs and the smooth, lanceolate fan leaves without filament, in contrast to the rather slender, elongate fan leaves of *A. amictus hilli*, which have a single notch on either side and a pronounced filament, make it impossible, at the present time, to regard the two forms as identical.



Figs. 1-7.—*Anopheles amictus hilli*, n. subsp. 1. Proboscis, palpus and antenna, $\times 33$. 2. Detail of propleuron, $\times 38$. 3. Hind tarsus, $\times 20$. 4. Wing, $\times 34$. 4a. A common variation of the proximal half of the costa, $\times 34$. 5. Head of larva, $\times 65$. 6. Shoulder hairs of larva, $\times 250$. 7. Pleural hairs of larva, $\times 65$.

the paratype series these bristles vary in number from 10 to 14. The halteres are pale with brownish scales covering the knob.

Legs. These have conspicuous patches of flat white scales on the coxae. The femora and tibiae are distinctly ringed and spotted with white scales. On the fore-leg, tarsus I has alternating black and white bands and an apical white band; tarsi II and III are dark in the centre with basal and apical white bands; tarsus IV is white and tarsus V dark. In the paratype series some specimens have a narrow black band or an indistinct dark patch in the centre of tarsus IV. On the mid- and hind-legs tarsus I has irregular white bands and spots and an apical white band; tarsi II, III and IV have apical and basal white bands and tarsus V is dark (Fig. 3).

*Wings.**—The costa shows two pre-humeral dark spots divided by a pale spot, a distinct humeral dark spot, the pre-sector dark spot divided by a pale spot, and the median, pre-apical and apical dark spots are undivided. On the stem of R, below the humeral dark spot, are two small distinct dark spots. The remaining veins show numerous alternating dark and light spots as shown in Fig. 4. In numerous specimens of the paratype series the pre-sector dark spot is undivided (Fig. 4a). This is an extremely variable character.

Abdomen.—Tergite I bears a few pale scales, tergites II–VIII are densely covered with broad, flat yellowish scales with some darker scales on VIII. Sternites I–VII carry scattered broad white scales in ill-defined lateral patches.

Male.

The palpi are dark scaled, with a patch of white scales dorsally on the basal half of segment II and a small white patch apically. Segment III has scattered white scales on the basal half and a white dorsal patch on the apical half followed by a narrow black area. Segments IV and V have large white patches on the inner dorsal aspect.

In all other respects the type male is similar to the female, except that tarsus IV of the fore-legs is dark with a few indefinite pale scales, and there is a slight difference in the abdomen in that tergite VIII has white instead of yellow scales. In the paratype series, however, male specimens possess fore- and mid-tarsi corresponding entirely with the female, and the wings also exhibit the same variations as recorded for the female paratypes.

Genitalia. No distinguishing features have been found and only a detailed comparative study of large series of this and related species would be likely to reveal any differential characters.

Larva. (Description from the morphotype series.)

Head. (Fig. 5.) The inner and outer anterior clypeals are usually frayed or weakly branched or more rarely simple, the outer anteriors being 0.5 to 0.75 as long as the inner anteriors. The posterior clypeals are usually simple, rarely bifid or trifid at the tip and project well beyond the anterior margin of the head, being about 0.15 as long as the inner anteriors. The inner suturals are simple or bifid and the outer suturals simple, bifid or trifid.

Thorax. The shoulder hairs (Fig. 6) have their bases distinctly separated with the inner hair arising from a simple alveolus without any tubercle while the middle hair has a somewhat weakly developed basal tubercle carrying a blunt spine. The inner hair is weakly developed, with about four branches (range 1–6).

The pleural tufts each bear one long plumose hair (Fig. 7).

Abdomen. Tergal plaques are present on segments I–VIII with small median accessory tergal plaques on segments III–VII. Palmate tufts occur on segments II–VII. The median plate of the scoop is broadly rounded anteriorly without any lateral projections.

Egg. (Fig. 8.)

The exochorion is entirely rugose, and a flat white waxy frill projects laterally and rests on the surface of the water. When removed from the water this frill may collapse and adhere to the dorsal surface. The approximate length is 0.61 mm. and the approximate maximum breadth, exclusive of floats is 0.16 mm.

* The terminology used in referring to the wing spots is that used by Gater, 1935, p. 3.

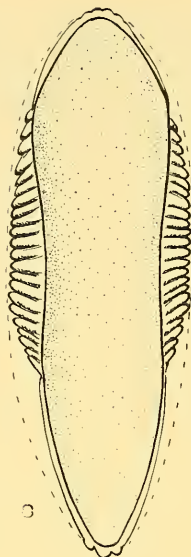


Fig. 8.—*Anopheles amictus hilli*, n. subsp., egg, $\times 115$.

Distribution.—This subspecies is widely distributed over the area where *A. amictus amictus* occurs but has also been recorded from Merauke in Dutch New Guinea. Specimens have been seen from the following localities: Northern Territory: Darwin; Adelaide R.; Margaret R.; Roper R., 59 miles E. of Mataranka; Roper Bar; Crocodile Point (Daly R.); Brocks Cr., Daly R.; Boorooloola; Koolpingah; Marrakai Station. Queensland: Lawn Hill (Saville Plain); Cairns; Townsville; Normanton; Brisbane. New South Wales: Larvae belonging to this subspecies or *A. amictus amictus* have been seen from Casino. Unfortunately the shoulder hairs were damaged so the identification must remain tentative. Western Australia: Wyndham. New Guinea: Merauke.

It will be seen from the descriptions that the two subspecies *A. amictus amictus* and *A. amictus hilli* are very closely related, and in the adult stage can only be differentiated by the banding of the hind tarsi. The larvae are also closely similar but appear separable on the average number of branches of the inner shoulder hair.

A. amictus hilli is frequently found breeding in brackish water even up to a salinity of 4.2%. Although it is also found inland in fresh-water, the coastal brackish water habitat is the more frequent. Records of *A. amictus amictus* from brackish water are very unusual and to our knowledge confined to one or two instances at Townsville.

A considerable amount of material has been examined from Merauke and only *A. amictus hilli* has been seen from there. Older records of *A. amictus* (Swellengrebel and Rodenwaldt, 1932, p. 198) from Dutch New Guinea also obviously refer to the subspecies *hilli*.

Acknowledgment.

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